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Japanese (PDF)

File Wrapper Information

FULL CONTENTS CLAIM + DETAILED DESCRIPTION
TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION
TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS
DRAWINGS

[Translation done.]

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Notes:

1. Untranslatable words are replaced with asterisks (* **).
2. Texts in the figures are not translated and shown as it is.

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Dictionary: Last updated 07/09/2010 / Priority:

FULL CONTENTS**[Claim(s)]****[Claim 1]An air knife comprising:**

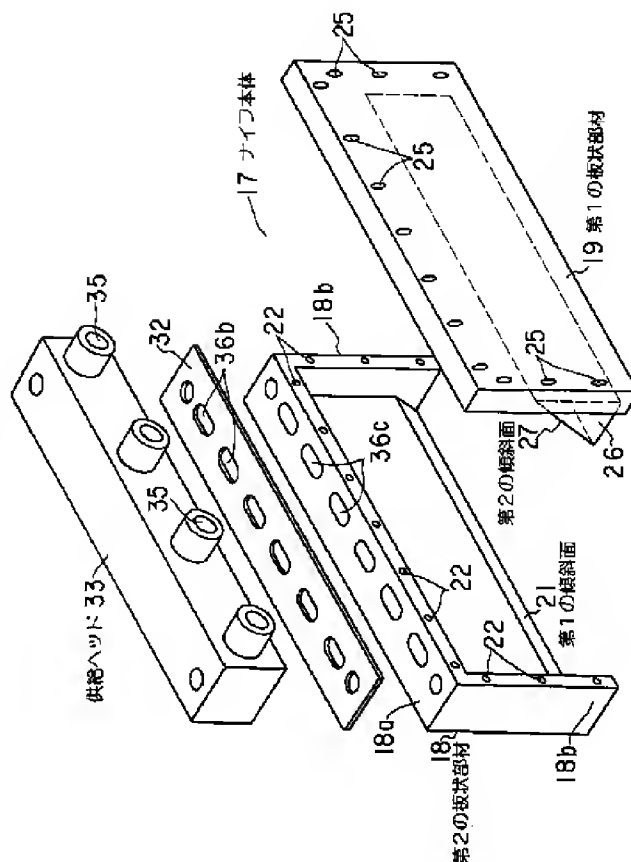
In an air knife from which a treating solution adhering to a processed material conveyed in a determined direction is removed by pressure of an air, it is the 1st plate-like member.

The 2nd plate-like member that forms a main part of a knife by the 1st plate-like member of the above while forming a space part where it is joined to this 1st plate-like member, and compressed air is supplied among these bonded surfaces.

The 1st slope formed in an end part of the 1st plate-like member of the above by inclining at an angle of predetermined to a bonded surface with the 2nd plate-like member of the above.

The 2nd slope that forms a slit which spouts compressed air which was inclined and formed in an end part of the 2nd plate-like member of the above with the almost same angle of gradient as the 1st slope of the above, and was supplied to the above-mentioned space part in the 1st slope of the above from the end side of the above-mentioned main part of a knife, A joint means which carries out connection fixation of the 1st joined plate-like member and the 2nd plate-like member in a predetermined slide position.

[Claim 2]While junction fixation of the supply head where two or more feed openings where compressed air is supplied to an other end side of the above-mentioned main part of a knife were established in a longitudinal direction with a prescribed interval is carried out via a

Drawing selection **Representative draw**

[Translation done.]

sheet shaped sealing member, A longitudinal direction of a space part of the above-mentioned main part of a knife is received in compressed air supplied at a supply head to either [at least] a portion joined to the above-mentioned main part of a knife of the above-mentioned supply head, or the above-mentioned sealing member. The air knife according to claim 1, wherein two or more introductory holes distributed almost uniformly are formed with a prescribed interval.

[Claim 3]While the injection direction of compressed air injected from the slit is arranged towards the conveyance direction and an opposite direction of the above-mentioned processed material, [the above-mentioned main part of a knife] The air knife according to claim 1 having projected a slope located in the conveyance direction front side of the above-mentioned processed material among the 1st slope and the 2nd slope which form the above-mentioned slit from an other end side of a main part of a knife rather than a slope located in the back side.

[Claim 4]The air knife according to claim 1 with which the 1st slope of the above and the 2nd slope where the above-mentioned slit consists of planes are characterized by countering in parallel by a length of not less than at least 15 mm along the jet direction of compressed air, and being formed.

[Claim 5]A dry tub processing unit characterized by the above-mentioned air knife being the composition indicated to Claim 1 in a processing unit which sprays and carries out the drying process of the compressed air which blows off from an air knife to a processed material which has a processing tub and is carried in to this processing tub.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the air knife for removing the treating solution adhering to a processed material, and the processing unit using that air knife.

[0002]

[Description of the Prior Art]For example, in the manufacturing process of a liquid crystal display or a semiconductor device, there are the membrane formation process and the photograph process of forming a circuit pattern in substrates, such as a glass substrate for liquid crystals as a processed material and a semiconductor wafer. In these processes, the above-mentioned substrate may be processed with a treating solution which is different one by one in each processing chamber.

[0003]In order that [in such a case,] the treating solution used in the first processing chamber may prevent the carried-in treating solution from adhering to the above-mentioned substrate, being carried into the next processing chamber or being mixed to other treating solutions, When a substrate is conveyed by the next processing chamber from the first processing chamber, compressed air is sprayed on the above-mentioned substrate with an air knife, and he carries out removal dryness and is trying for the above-mentioned treating solution to prevent it being carried into other processing chambers, or mixing with other treating solutions.

[0004]While the above-mentioned air knife joins the plate-like member of two sheets and uses it as the main part of a knife, it comes to form

the slit which made the space part where compressed air is supplied among these bonded surfaces, and this space part open one end for free passage, and made the end face of the main part of a knife open the other end wide. And it is made to carry out removal dryness of the treating solution adhering to the substrate by turning to ***** the compressed air supplied to the above-mentioned space part, and injecting it to the above-mentioned slit.

[0005]In the air knife of such composition, it is required on the performance that the interval of the above-mentioned slit should be set up with high precision.

[0006]While the conventional air knife combines the 3 side except the 1 side in which the slit opened the plate-like member of two sheets wide with a joint screw, [the knife] Two or more adjustment screws were formed in the 1 side in which the slit was formed with the prescribed interval to that longitudinal direction, and it had become the composition of setting up the interval of the above-mentioned slit, by adjusting the amount of screwing of this adjustment screw.

[0007]However, after combining the plate-like member of two sheets with a joint screw according to such composition, in order to have to adjust the interval of a slit with an adjustment screw, A thing, such as requiring skill, was among adjustment work which adjusts the amount of screwing of it not only being said that the assembly work takes time and effort but two or more adjustment screws, is constant and sets up the interval of the longitudinal direction full length of a slit.

[0008]

[Problem to be solved by the invention]Thus, since he was trying to set up the interval of a slit with two or more adjustment screws after the conventional air knife combined a pair of plate-like members with the joint screw, there was a thing, like it is difficult to make regularity the interval of the assembling work not only taking time and effort but a slit covering full length.

[0009]Providing the drying process device with which the air knife which enabled it to adjust the interval of assembling work and a slit easily, and its air knife were used has this invention.

[0010]

[Means for solving problem]In the air knife from which the invention of Claim 1 removes the treating solution adhering to the processed material conveyed in a determined direction by the pressure of an air, The 1st plate-like member and the 2nd plate-like member that forms the main part of a knife by the 1st plate-like member of the above while forming the space part where it is joined to this 1st plate-like member, and compressed air is supplied among these bonded surfaces, The 1st slope formed in the end part of the 1st plate-like member of the above by inclining at an angle of predetermined to the bonded surface with the 2nd plate-like member of the above, The 2nd slope that forms the slit which spouts the compressed air which was inclined and formed in the end part of the 2nd plate-like member of the above with the almost same angle of gradient as the 1st slope of the above, and was supplied to the above-mentioned space part in the 1st slope of the above from the end side of the above-mentioned main part of a knife, The joint means which carries out connection fixation of the 1st joined plate-like member and the 2nd plate-like member in a predetermined slide position was provided.

[0011]Combination of these plate-like members and adjustment of the

interval of a slit can be performed only by carrying out connection fixation of the 1st plate-like member made to slide to a predetermined state, and the 2nd plate-like member by it.

[0012]In the invention of Claim 1, the invention of Claim 2, [the other end side of the above-mentioned main part of a knife] While junction fixation of the supply head where two or more feed openings to which compressed air is supplied were established in the longitudinal direction with the prescribed interval is carried out via a sheet shaped sealing member, Two or more introductory holes which distribute almost uniformly the compressed air supplied to the supply head to the longitudinal direction of the space part of the above-mentioned main part of a knife are formed in either [at least] the portion joined to the other end side of the above-mentioned main part of a knife of a supply head, or the above-mentioned sealing member with the prescribed interval.

[0013]It is that compressed air is supplied to a chamber member from a feed opening by it, Compressed air can be made to inject by almost uniform pressure from the longitudinal direction full length of a slit by distributing in the interior space, and pressure distribution being equalized, and also two or more introductory holes distributing almost uniformly, flowing into the space part of the main part of a knife, and injecting from a slit.

[0014]In the invention of Claim 1, the invention of Claim 3, [the above-mentioned main part of a knife] While the injection direction of the compressed air injected from the slit is arranged towards the conveyance direction and opposite direction of the above-mentioned processed material, The slope located in the conveyance direction front side of the above-mentioned processed material among the 1st slope and the 2nd slope which form the above-mentioned slit is projected from the other end side of the main part of a knife rather than the slope located in the back side.

[0015]Since it is prevented that a part of compressed air injected towards the substrate by the portion which one slope projected by it from the slit flows in the conveyance direction of a substrate, the treating solution adhering to a substrate will be certainly removed behind [conveyance direction] a substrate.

[0016]As for the invention of Claim 4, in the invention of Claim 1, the 1st above-mentioned slope and 2nd slope that consist of planes counter in parallel by a length of not less than at least 15 mm along the jet direction of compressed air, and the above-mentioned slit is formed.

[0017]By it, since there is neither a crevice nor a convex part in the inside of a slit, compressed air can be injected at the almost uniform flow velocity from the longitudinal direction full length of this slit, and it becomes possible to make into laminar flow compressed air injected from a slit because the length of a slit is moreover not less than 15 mm.

[0018]The invention of Claim 5 has a processing tub and it is characterized by the above-mentioned air knife being the composition indicated to Claim 1 in the processing unit which sprays and carries out the drying process of the compressed air which blows off from an air knife to the processed material carried in to this processing tub.

[0019]The drying process of the substrate can be carried out with the air knife which can perform interval adjustment of assembling work or a slit easily by it.

[0020]

[Embodiment of the Invention]Hereafter, the 1 embodiment of this invention is described with reference to drawing 1 thru/or drawing 3.

The processing unit shown in drawing 3 is provided with the processing tub 11. This processing tub 11 is making the shape of a box type which the upper surface opened wide, the carrying-in mouth 12 is formed in that 1 side, and the taking-out mouth 13 is formed in the other side.

[0021]The roller 14 which constitutes a conveyance mechanism, respectively is allocated in the inside of the processing tub 11, the exterior by the side of the carrying-in mouth 12, and the exterior by the side of the taking-out mouth 13 on the same height level, enabling free rotation. These rollers 14 are rotated by the source of a drive which is not illustrated. In the above-mentioned processing tub 11, the substrates 15, such as a semiconductor wafer as a processed material and a glass substrate for liquid crystals, are carried in from the above-mentioned carrying-in mouth 12 by it, and it is conveyed in the direction of an arrow.

[0022]The substrate 15 carried in to the processing tub 11 is processed by treating solutions, such as a medical fluid and pure water, by the previous process, and the treating solution L has adhered to the up-and-down side. The up-and-down side of the above-mentioned substrate 15 is countered at the processing tub 11, the air knife [long picture / width dimension / of the substrate 15 / slightly respectively] 16 is allocated, and removal dryness is carried out so that the treating solution L which adhered to the above-mentioned substrate 15 with this air knife 16 may mention later.

[0023]The above-mentioned air knife 16 has the rectangular parallelepiped-like main part 17 of a knife, as shown in drawing 1 and drawing 2. It comes to join the 1st plate-like member 18 and 2nd plate-like member 19 as for this main part 17 of a knife.

[0024]While the 1 side and an end side (lower end side) open the 1st plate-like member 18 wide and the top wall 18a and a pair of flank walls 18b are making the shape of a box type established, respectively to the remaining 3 side, the 1st slope 21 that becomes a lower end part of the inside from the plane inclined toward the other side side -- method ** of longitudinal -- it is mostly formed covering full length. The length size of the up-and-down direction of this 1st slope 21 is formed in 15 mm by predetermined length, a length of not less than at least 15 mm, and this embodiment.

[0025]Two or more screw holes 22 are formed in the end face of the above-mentioned top wall 18a and a pair of flank walls 18b with the prescribed interval, respectively. The 2nd plate-like member 19 of the above joins the 1 side to these end faces, and is provided in them. Two or more long long holes 25 are formed in three flanks corresponding to the top wall 18a of the 1st plate-like member 18 of the above, and a pair of flank walls 18b in this 2nd plate-like member 19 with the prescribed interval along the up-and-down direction.

[0026]the convex part 26 of the shape of a square pillar to which the section made the right-angled triangle in the lower end part of the 1 side of the 2nd plate-like member 19 of the above -- method ** of longitudinal -- it is mostly provided covering full length. One side of this convex part 26 forms the 2nd slope 27 that consists of a plane longer enough than 15 mm in length which incline at the same angle as

the 1st slope 21 of the above, and meet in the up-and-down direction of the 1st slope 21.

[0027]If the 2nd plate-like member 19 is joined to the 1st plate-like member 18, as shown in drawing 2 (a), these 1st and 2nd slopes 21 and 27 will counter in parallel at the predetermined intervals, and will form the slit 28.

[0028]A lower end opens the above-mentioned slit 28 wide to the lower end side of the main part 17 of a knife, and it inclines at an angle of predetermined to the thickness direction of the main part 17 of a knife while an upper end is open for free passage to the space part 29 formed between the bonded surfaces of the 1st plate-like member 18 of the above, and the 2nd plate-like member 19.

[0029]As shown in drawing 2 (b), while thrusting the screw 31 into the screw hole 22 of the 1st plate-like member 18 of the above from the long hole 25 of the 2nd plate-like member 19 of the above, [making the 2nd plate-like member 19 slide to the figure (b) along with the longitudinal direction shown by an arrow within the limits of the above-mentioned long hole 25, before fixing the 2nd plate-like member 19 firmly to the 1st plate-like member 18] The interval of the 1st slope 21 of the above and the 2nd slope 27, i.e., the interval of the slit 28, can be set up. And after setting the interval size of the slit 28 as a predetermined size, junction fixation of the 1st plate-like member 18 of the above and the 2nd plate-like member 19 will be carried out by tightening the above-mentioned screw 31.

[0030]The 2nd slope 27 of the above is formed in the up-and-down direction for a long time rather than the 1st slope 21. And if junction fixation of the 1st plate-like member 18 and 2nd plate-like member 19 is carried out, the lower end part of the 2nd slope 27 will turn into the projection part 27a projected slightly from the lower end part of the 1st slope 21.

[0031]The rectangular pipe-like supply head 33 is joined to the upper end face of the above-mentioned main part 17 of a knife via the sealing member 32 of a rectangle sheet shaped, and this supply head 33 is being fixed to the above-mentioned main part 17 of a knife with the screw 34, as shown in drawing 2 (b).

[0032]The feed opening 35 of plurality [head / 33 / above-mentioned / supply / side / 1] is formed in the longitudinal direction with the prescribed interval. From each feed opening 35, compressed air is supplied to the space part 33a of the supply head 33. The introductory holes 36a, 36b, and 36c are drilled in the longitudinal direction by the top wall 18a of the wall of the bottom joined to the above-mentioned main part 17 of a knife of this supply head 33, the above-mentioned sealing member 32, and the 1st plate-like member 18 with the prescribed interval, respectively.

[0033]With it, [the compressed air supplied to the space part 33a of the supply head 33 from the above-mentioned feed opening 35] After pressure distribution is equalized by being spread in this space part 33a, two or more introductory holes 36a, 36b, and 36c distribute almost uniformly, and it flows into the space part 29 of the main part 17 of a knife, and is spread here, and it is equalized again and pressure distribution is injected from the slit 28. therefore, compressed air -- method ** of longitudinal of the slit 28 -- it will be mostly injected by uniform pressure from full length.

[0034]And the above-mentioned air knife 16 is arranged towards the opposite direction at the above-mentioned processing tub 11 to the conveyance direction of the substrate 15 in the jet direction of the compressed air which blows off from the slit 28 which inclined at an angle of predetermined to the main part 17 of a knife as shown in drawing 2 (b) and drawing 3.

[0035][according to the air knife 16 of such composition, constituting the main part 17 of a knife from the 1st plate-like member 18 and 2nd plate-like member 19, and making the 2nd plate-like member 19 slide to the 1st plate-like member 18] The interval size of the slit 28 determined with the opposite interval of the 1st slope 21 of these plate-like members 18 and 19 and the 2nd slope 27 was set up.

[0036]That is, what is necessary is to tighten the screw 31 and just to fix these plate-like members 18 and 23 in the state of junction, after making the 2nd plate-like member 19 slide to the 1st plate-like member 18 and setting up the interval size of the slit 28.

[0037][therefore the thing for which the slide position of the 2nd plate-like member / as opposed to / the assembling work is easy and / the 1st plate-like member 18 moreover / 19 is set up since the interval size of the slit 28 can also be set up, if junction fixation of a pair of plate-like members 18 and 23 is carried out] The interval size of the slit 28 can be set up with high precision.

[0038]Pressure distribution is equalized by the compressed air supplied to the air knife 16 flowing into the space part 33a of the supply head 33 from the feed opening 35, and being spread. [subsequently the thing distributed by two or more introductory holes 36a and 36b formed in the supply head 33 and the sealing member 32] It becomes almost uniform pressure distribution to the longitudinal direction of the main part 17 of a knife, and will flow into the space part 29 of the main part 17 of a knife, and the pressure distribution in the space part 29 will be further equalized by distributing in this space part 29.

[0039]That is, although it is in a turbulent flow state, the compressed air which flows into the supply head 33 from the feed opening 35 is repeating distribution and diffusion, and pressure distribution serves as almost uniform laminar flow, and injects it from the slit 28. Therefore, it becomes possible to dry uniformly the whole surface of the substrate 15 which makes a plate surface counter the air knife 16, and is conveyed.

[0040]The lower end part of the 2nd slope 27 of the 2nd plate-like member 19 that forms the above-mentioned slit 28 is the projection part 27a projected slightly from the lower end part of the 1st slope 21. Therefore, as are shown in drawing 2 (a), and a part of compressed air X injected by the projection part 27a toward the substrate 15 conveyed from the slit 28 shows by the arrow Y of a dashed line, carrying out a part style in the conveyance direction of the substrate 15 will be prevented.

[0041]Since most compressed air injected from the slit 28 flows into the conveyance direction and opposite direction of the substrate 15, it enables it to remove certainly the treating solution L which adhered to the plate surface of this substrate 15 as shown in drawing 3 from the conveyance direction back end side of the substrate 15.

[0042]It does not incline to make the injection direction of the compressed air from the slit 28 incline, but what is necessary is just to

arrange the main part 17 of a knife almost perpendicularly to it, since the slit 28 inclines and is formed to the main part 17 of a knife.

Therefore, it becomes possible to install in few spaces compared with the case where the main part 17 of a knife is made to incline.

[0043]The 1st slope 21 and 2nd slope 27 that form the above-mentioned slit 28 counter by a length of not less than 15 mm, and since the adjustment screw for interval adjustment of the slit 28 moreover is not formed like before, there is no uneven part between the opposed face. Therefore, it becomes possible to fully raise the flow velocity about the compressed air injected from the slit 28.

[0044]As for drawing 4, the slit 28 shows the experimental result which measured the flow velocity of the case where a foreign substance exists, there is a crevice, or there is a convex part, and the case where there are these [no]. The opposite length of the 1st slope 21 and the 2nd slope 27 was set as 15 mm.

[0045]In the figure, the flow velocity of the compressed air which flows through a slit in that case by the case where the portions of A, B, and C do not have anything in the slit 28 was 32-38 m/sec. By the case where, as for D, a foreign substance exists in the slit 28 in the figure, the flow velocity in that case fell [sec] in 15 m /. By the case where the Drawing E has a crevice in the slit 28, F is a case where there is a convex part and the flow velocity fell [sec] in 22-24 m /in these cases.

[0046]From the above thing, like this invention, when there was neither a foreign substance nor an uneven part in the slit 28, it was checked that the flow velocity of the compressed air injected from the slit 28 can be raised.

[0047]Although the introductory hole was formed in both the supply head and the sealing member with the prescribed interval at the above-mentioned 1 embodiment at the longitudinal direction, An introductory hole is formed in either a supply head or a sealing member, when another side is a supply head, the opening of the portion which he sleeps and is joined to an awe main part may be carried out over the whole, and when another side is similarly a sealing member, this sealing member may be formed in frame shape, and it may be.

[0048]

[Effect of the Invention]While joining the 1st plate-like member in which the 1st slope was formed, and the 2nd plate-like member in which the 2nd slope was formed according to the invention of Claim 1, enabling a free slide, By fixing these plate-like members in the state of a predetermined slide, the slit of the predetermined interval was formed in the 1st slope of the above, and the 2nd slope.

[0049]Therefore, it becomes possible to set a slit with sufficient accuracy as a predetermined interval size, without requiring complicated assembly work.

[0050]After making the compressed air supplied to the supply head flow into the space part of the main part of a knife through two or more introductory holes from a feed opening, it was made to make it inject from a slit according to the invention of Claim 2.

[0051]Therefore, since it becomes possible to make compressed air inject by almost uniform pressure from the longitudinal direction full length of a slit, a processed material can be dried uniformly.

[0052]According to the invention of Claim 3, the compressed air injected towards the conveyance direction and opposite direction of a

processed material from a slit was prevented from flowing in in the conveyance direction of a processed material.

[0053]Therefore, since the treating solution adhering to a processed material is removable to the conveyance direction back end side of a processed material, the dryness can be ensured.

[0054]According to the invention of Claim 4, since the slit formed from the 1st slope and the 2nd slope which are parallel planes, there is nothing, like the adjustment screw for adjusting a crevice, a convex part, or an interval protrudes in the inside of a slit.

[0055]Therefore, compressed air can be injected at the almost uniform flow velocity from the longitudinal direction full length of this slit, and it becomes possible to make into laminar flow compressed air injected from a slit because the length of a slit is moreover not less than 15 mm.

[0056]According to the invention of Claim 5, the drying process device which has an air knife which can set a slit with sufficient accuracy as a predetermined interval size can be provided, without requiring complicated assembly work.

[Brief Description of the Drawings]

[Drawing 1]The exploded perspective view showing the air knife of the 1 embodiment of this invention.

[Drawing 2]As for (a), (b) is a longitudinal section of an assembly state [in / similarly / the longitudinal direction halfway part of the main part of a knife], and a longitudinal section of an assembly state [in / similarly / the longitudinal direction end of the main part of a knife].

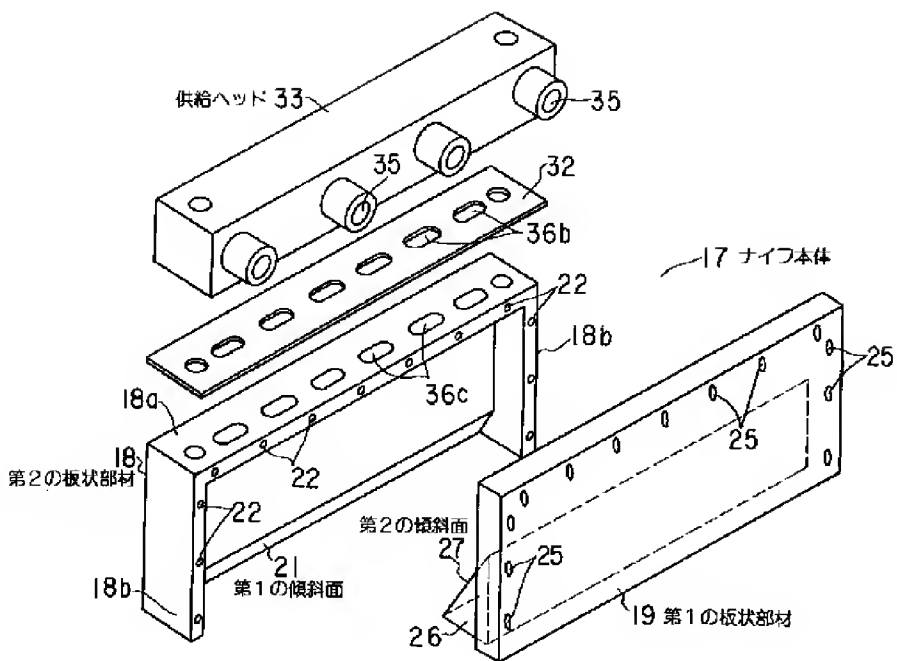
[Drawing 3]Similarly it is a rough lineblock diagram of a processing unit.

[Drawing 4]The graph which shows the measurement result of the flow velocity of the compressed air which similarly flows through a slit.

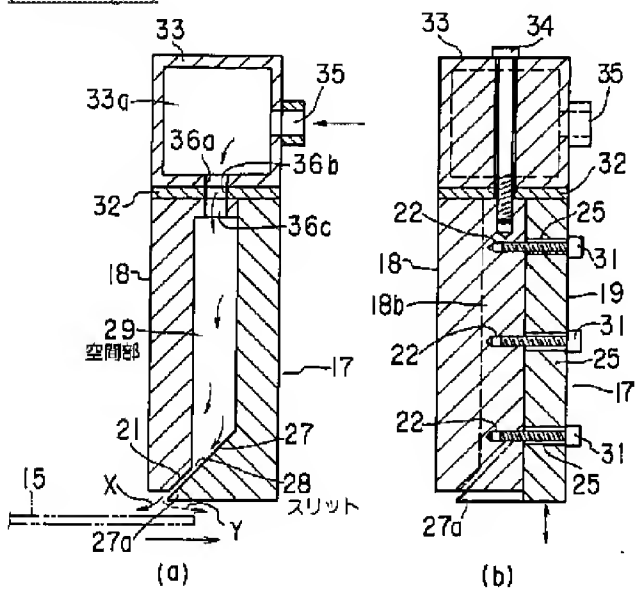
[Explanations of letters or numerals]

- 11 -- Processing tub
- 15 -- Substrate (processed material)
- 16 -- Air knife
- 17 -- Main part of a knife
- 18 -- The 1st plate-like member
- 19 -- The 2nd plate-like member
- 21 -- The 1st slope
- 27 -- The 2nd slope
- 28 -- Slit
- 29 -- Space part
- 33 -- Supply head

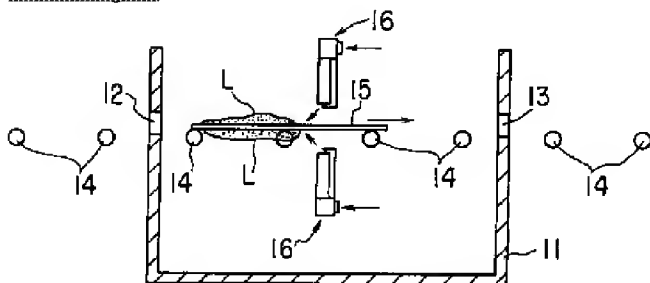
[Drawing 1]



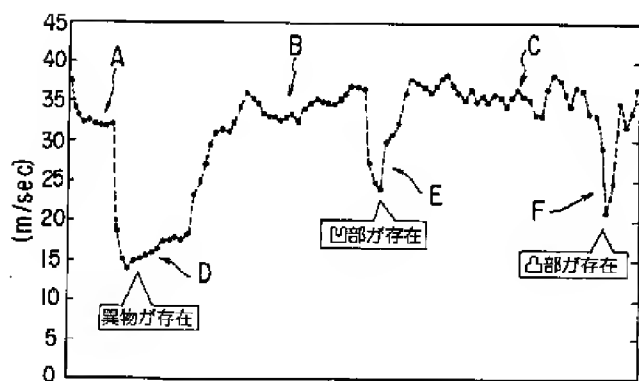
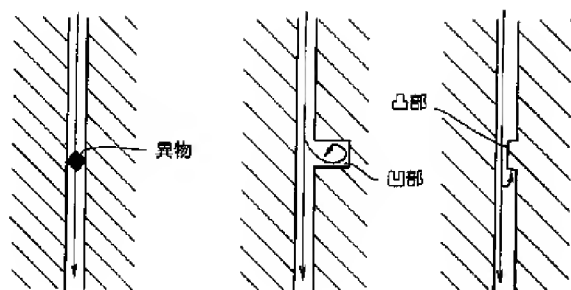
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

Report Mistranslation

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